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FREEZING DECAYED WOOD TO FACILITATE RING COUNTS AND WIDTH MEASUREMENTS

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ABSTRACT

Accurate ring counts and radial growth measurements on decayed transverse wood sections are possible when rotted wood is frozen. Technique was successfully used during stem analysis studies of old-growth mixed conifers in the Oregon-Washington Cascade Range.

Keywords: Tree rings, forest measurement, wood decay.

To count rings of old-growth trees is difficult even under the best conditions, but to count such rings in rotten or partially decayed transverse sections of wood is nearly impossible, even when ring pattern is not completely obliterated.

The technique of freezing small, rotten wood samples to provide thin sections for microbiological investigation has been known for many years.[1/] [2/] However, stem analysis research using the freezing technique to facilitate annual ring count and examination on large, rotten wood sections does not seem to be reported. Although other embedding and non-embedding techniques useful in preparation of rotten wood samples for microtome sectioning are favored over the freezing method,[3/] freezing is well suited for the less exacting sequential count and measurement procedures used in tree stem analysis work.

Among other techniques facilitating growth-ring counts and measurements in the field is that of wax impregnation. Ghent[4/] used that method for collection of study material from badly deteriorated trembling aspen. However, his wax treatment also was designed more for facilitating growth-ring measurements from slides than from larger transverse wood sections.

During the course of research work, gathering old-growth stem analysis data for site index studies in the Oregon-Washington Cascade Range, we encountered occasional heart rot on a stump or breast-high section. No trees with visible indications of internal decay were selected, but because external indicators are not always present, occasional trees with rotten butt sections were felled. Regardless of rot, it was essential that ring counts and width measurements be made as accurately as possible.

Quite by accident the freezing method was "rediscovered." A large, central portion of a 400-year-old Douglas-fir that had been felled for stem analysis had a brown cubical butt rot[5/] (fig. 1). Using conventional techniques in a rainstorm, we attempted to count the rings and measure sequential radial growth in the rotten heartwood. The decayed wood tissue crumbled easily and,

[1/] Donald Alexander Johansen. Plant microtechnique. New York, McGraw-Hill Book Co., Inc., p. 106, 1940.

[2/] John E. Sass. Botanical microtechnique. Ames, Iowa State Univ. Press, ed. 3, p. 93-94, 1958.

[3/] Wayne W. Wilcox. Preparation of decayed wood for microscopical examination. Madison, Wis., Forest Prod. Lab., USDA Forest Serv. Res. Note FPL-056, p. 7, 1964.

[4/] Arthur W. Ghent. The treatment of decayed wood from dead trembling aspen trees for growth-ring analysis. For. Chron. 30: 280-283, 1954.

[5/] *Phaeolus schweinitzii* (Fr.) Pat. (= *Polyporus* Fr.). Cultural identification made by Paul E. Aho, Plant Pathologist, USDA Forest Service, Pacific Northwest Forest and Range Experiment Station, Corvallis, Oreg. Successful culture was made after 32 months of 0° F. cold storage, during which time the specimen partially dried.

Figure 1.--The 70-inch Douglas-fir stump near Mount Rainier from which the frozen, decayed wood sample for ring count and measurement was taken.

even though the thinnest, sharpest razor blade available was used, ring measurements and counts could not be made.

The following morning the rotten stump and breast-high-cut butt sections were frozen. Sequential radial ring-growth measurements and counts were made with ease. Razor knife cuts through the frozen, rotten wood clearly revealed the rings that had given so much trouble previously.

Following this, whenever rotten wood was encountered, provision was made to collect a radial transverse section containing an average or representative radius. The only difference between the collection of a radial section containing rot and one without rot was the thickness. Ordinarily, only 1-inch-thick rectangular sections, carefully cut with a chain saw, were collected for laboratory examination. Where decay was encountered, a 4- to 6-inch-thick rectangular piece was taken (fig. 2). This was then carefully sandwiched between quarter-inch plywood to forestall breakage and was transported to the laboratory. Before ring measurements and counts were attempted, the section was submerged in water for several hours and then frozen.

In addition to Douglas-fir, partially rotten radial sections of western white pine, western hemlock, and Pacific silver fir all have been successfully analyzed by the freeze method. Rings in rotten wood sections of other coniferous tree species, and perhaps even those of hardwoods, can be measured and counted accurately if the rotten wood still contains identifiable rings and is not unduly distorted.

Freezing wood sections, whether

Figure 2.--Partially decayed Douglas-fir radial section which was frozen to provide accurate ring measurement data.

rotten or sound, changed wet-green radial dimensions but little. Radial dimension change within the decayed portions seemed to be more influenced by the amount of innate moisture present than by subsequent soaking and freezing. Rotten wood of the dry, cubical type in advanced stage of deterioration such as reported here was expanded radially only a small and indeterminate amount by soaking and freezing. Measurement errors incurred following these procedures are more reasonably assigned to the rot itself than to the freezing technique. Influence of soaking and freezing on dimensions other than radial was not observed.

Possibly the only precaution that must be taken is that sequential radial growth measurements and accompanying annual ring counts must be made quickly, before the frozen, decayed wood thaws. Should thawing obliterate the radius under observation, the section containing the decayed wood must be refrozen and a new razor-knife-cut surface prepared. Another solution, although not actually tried, would be to make the necessary counts and measurements in a room with temperature below 32° F.

Besides facilitating stem analysis and tree ring research in old-growth coniferous trees, the decayed wood freezing technique might prove advantageous for workers examining rotten wood for cull and defect prediction. Similarly, wherever ring measurements or counts are necessary, as in dendrochronological and tree growth studies, the freezing of rotten wood might provide answers that otherwise might not be available.

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